DETECTION OF *P. parvum* AND ICHTHYOTOXICITY

By

Aaron Barkoh

Electron microscopic examination of scale morphology is required for positive identification of *P. parvum* (Green *et al.*, 1982; Guo *et al.*, 1996); however, presumptive identification by visual examination of water bodies, subsurface water samples, and fish or other gill-breathing organisms is adequate for decision-making in controlling blooms and toxicity. Visual indications of toxic *P. parvum* blooms include yellow or golden to rust-colored water and foaming where the water is agitated, especially at the shorelines of impoundments (Sager et al. 2007). Stressed, lethargic or dead fish may be observed. Affected fish bleed from the gills and show hemorrhaging of the skin, particularly at the fins, mouth, opercula, and eyes. Live fish may swim slowly, lie on the bottom, congregate near the shore or a freshwater source, or leap out of the water to attempt to escape further harm.

Microscopic examination of subsurface water samples is required to tentatively confirm presence of the alga in bloom phase as described above or in the non-bloom phase where no abnormal color or foaming of the water is present. Examination of subsurface water samples (e.g., ≥15.2-cm depths) is recommended because *P. parvum* is light-sensitive and avoids the water surface (Paster, 1973). Magnifications of 400-1,000X are required for identification of *P. parvum* cells. Taxonomic features for identification include a sub-spherical to elongate body of about 8-11 µm long and 3-5 µm wide, and two flagella (each 12-15 µm long) and a haptonema (3-5 µm long) arising from an anterior pit (Lee, 1980; Green et al., 1982; Bold and Wynne, 1985; Larsen, 1999). The haptonema is flexible and non-coiling that can be used to attach the cell to a surface when the alga is resting. Two large yellow-green, deeply-lobed chloroplasts are situated lateral-parietally to present a C-shaped appearance. The alga exhibits a characteristic swimming motion of forward movement while spinning on its longitudinal axis (Green et al. 1982). Identification of *P. parvum* in unpreserved water samples is recommended since it is easier to identify live than dead specimens and common preservatives (Lugol's solution and glutaraldehyde) either mask the characteristic color and features or cause the alga to lose its haptonema and flagella.

The toxins produced by *P. parvum* are collectively called prymnesins with ichthyotoxic, cytotoxic, neurotoxic, and hemolytic activities (Ulitzur and Shilo, 1966; Sarig, 1971; Paster, 1973; Shilo and Sarig, 1989). For fish the ichthyotoxin is most problematic and its presence is determined by a bioassay using the fish model (Ulitzur and Shilo, 1964; Sarig, 1971). This bioassay is an essential *P. parvum* management tool because it uses a cationic activator (co-factor) that allows detection of the ichthyotoxin at sublethal levels thereby allowing measures to be taken to prevent fish mortality.